

REMARKS

Claims 1-14 are pending in the present application, and are rejected. Claims 1, 10 and 12-13 are herein amended. New claims 15-17 have been added. No new matter has been presented.

Applicants note that the lower limit “4 mm” along the maximum side is based on the disclosures of Examples 1 and 5 of the present specification. Furthermore, the lower limit “0.5 mm” in a magnetic anisotropy direction is also based on the disclosures of Examples 1 and 5.

Claim Clarification

Applicants submit that the additional steps of claims 12 and 13 including cleaning the sintered magnet form or blasting the sintered magnet form, respectively, are performed before the step of disposing the powder on the surface of the magnet form. Applicants herein amend these claims to clarify the invention.

Double Patenting

Claims 1-4 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 and 11-20 of copending Application No. 11/783,639.

Applicants submit herewith a terminal disclaimer in compliance with 37 C.F.R. §1.321(c) to overcome the double patenting rejection.

Claim Rejections - 35 U.S.C. §102(e)

Claims 1 and 4-10 are rejected under 35 U.S.C. §102(e) as being anticipated by US 7,163,591 to Kim et al.

The Examiner notes the method beginning in column 3 of the cited reference where R-Fe-B sintered magnets or scraps thereof are mechanically crushed to between 50-500 micron powders. These powders are thus the “magnet form” as stated in the claim being that a powder is a magnetic form and this powder has already gone through a sintering process. Rare earth fluorides such as dysprosium fluoride, neodymium fluoride and praseodymium fluoride are then mixed with the sintered magnetic powders. Theses mixed powders are then heat treated at between 500-1100°C in a vacuum or an inert gas atmosphere (column 3, lines 27-37). Kim et al. later states that the sintering temperature of the magnets is 1100C, making the heat treatment lower than the sintering temperature of the magnets (column 4, line 4).

Claim Rejections - 35 U.S.C. §103(a)

Claims 2 and 3 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kim et al.

The Examiner asserts that Kim et al. teaches at column 3, lines 27-37 that the powder included as its magnetic form is between 50 and 500 microns in size. The Examiner concludes that both the magnetic anisotropy direction and the maximum side of these particles would be less than 2mm and 20 mm respectively. Therefore, this range represents an overlapping range with those sizes claimed. The Examiner concludes that it would have been obvious to select from the overlapping portions of these ranges and arrive at the claimed invention.

Claim 11 is rejected under 35 U.S.C. §103(a) as being unpatentable over Kim et al. as applied to claim 1 above, and further in view of Sagawa in 5,250,255.

Claims 12 and 14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kim et al. as applied to claim 1 above, and further in view of US 5,286,366 to Mitsuji. The Examiner concludes that one would have found that this process of Mitsuji would be highly applicable to the magnetic material as described by Kim et al. The process would then be conducted on a sintered body made from the magnetic forms of Kim to produce high quality product that was applicable to situations where a corrosion resistant magnet was needed.

Claim 13 is rejected under 35 U.S.C. §103(a) as being unpatentable over Kim et al. as applied to claim 1 above, and further in view of US 6,777,097 to Hamada et al., assigned to the present assignee.

The Examiner admits that Kim et al. does not teach using an acid, alkali, or organic solvent to clean or dispose the powder on the surface of the magnet form. (The Examiner's statement appears to have been a typographical error, and should apparently have indicated that "Kim et al. does not teach using shot blasting to clean or dispose the powder on the surface of the magnet form.") However, the Examiner asserts that Hamada et al teaches that it is beneficial to add a composite coating to the surface of an Nd-Fe-B type magnet due to this composition's inherently poor chemical resistance, which is improved by adding a silicone resin along with flakes of fine powder to prevent chemical degradation. The Examiner asserts that the use of this process would clean the surface of the magnetic form of oxides in order to allow the plating process to occur, and further asserts that under this interpretation the particles of Kim et al. are

an initial magnetic form, where the formed particles represent a final magnetic form. The Examiner concludes that one would have found that this process of Hamada et al would be highly applicable to the magnetic material as described by Kim et al. The process would then be conducted on a sintered body made from the magnetic forms of Kim et al. to produce a high quality product that was applicable to situations where a corrosion resistant magnet was needed.

Applicants Response to the Rejections under 35 U.S.C. §102 and §103

Applicants herein amend claims 1, 10 and 12-13 to clarify the invention. Thereafter, Applicants respectfully disagree with the rejections because the claimed invention is not taught or fairly suggested by the cited references, alone or in combination.

Applicants note that Kim et al. discloses a method of preparing a micro-structured powder for bonded magnets having high coercivity, comprising:

- (a) mechanically crushing or hydrogen decrepitating a R-Fe-B type anisotropic sintered magnet or scraps thereof, to prepare R-Fe-B type anisotropic permanent magnet powders having an average size of 50-500 μm ;
- (b) mixing the R-Fe-B type anisotropic permanent magnet powders with 1-10 wt % of rare earth fluoride (RF_3) powders having a size of 0.1-50 μm , to obtain mixed powders; and
- (c) thermally treating the mixed powders at 500-1100 $^{\circ}\text{C}$ in a vacuum or an inert gas atmosphere, to prepare R-Fe-B type anisotropic permanent magnet powders.

On the other hand, in the present invention, the sintered magnet form to be heat treated with the R^2 , R^3 or R^4 -containing powder has a dimension of at least 0.5 mm in a magnetic anisotropy direction.

As is apparent from the description of Examples of the present specification, the dimension in a magnet anisotropy direction is the minimum dimension in the rare earth permanent magnet material. Therefore, the lower limit of the maximum dimension is more than 0.5 μm , which is different from the powders having an average size of 50 to 500 μm to be heat treated with rare earth fluoride powders.

Applicants note that the micro-structured powder of Kim et al. is used for bonded magnet, as is apparent from the description at column 4, lines 28-29 of Kim et al., which indicates that, "If the powders are larger than 500 μm , it is difficult to prepare a resin magnet using the above powders".

On the other hand, the rare earth permanent magnet material itself prepared by the inventive method is used as a high-performance compact or thin permanent magnet. The inventive magnet material is not used for bonded magnet.

Moreover, as is defined in claim 16, the sintered magnet form to be heated according to the present invention is not obtained by mechanically crushing or hydrogen decrepitating as in Kim et al. Obviously, because the sintered magnet form to be heated has a dimension of 4 to 100 mm along its maximum side, it cannot be obtained by mechanically crushing or hydrogen decrepitating.

Moreover, Kim et al. discloses at column 5, lines 18 to 25 that, “Therefore, an additive is used to restore the coercivity to be close to the magnetic characteristics of the sintered magnet. As in FIG. 4, the coercivity of the thermally treated powders including various additives is shown. In cases of using R-fluoride (DyF_3 , NdF_3 , PrF_3) as the additive, the coercivity has a greater increase, compared to cases without the additive. However, oxides and chlorides have a negative influence on the coercivity.”

On the other hand, in the present invention, not only fluorides but also oxides of a rare earth element can give an effect on coercive force. This proves that the inventive method would not have been prompted by the method of Kim et al. using magnet powders having an average size of 50-500 μm .

Therefore, Applicants respectfully submit that the present invention is patentably distinguished from Kim et al. The feature of the present invention is not expected from Kim et al.

Specifically with respect to claims 6 and 8, the content “at least 10 atom%” of Dy or Tb is the content in R^2 , R^3 or R^4 . Applicants surmise that the Examiner may misunderstand claims 6 and 8. Moreover, the total concentration of Nd and Pr in claim 8 is the concentration in R^1 , R^3 and R^4 .

With respect to claim 10, Applicants herein amend claim 10 so that the temperature for aging treatment is at least 350°C. Therefore, claim 10 is differentiated from Kim et al.

Further with respect to claim 11, Applicants submit that “Wet Die Processing” is quite different from disposing the powder in the surface of the magnet form as a slurry thereof dispersed in aqueous or organic solvent. “Wet Die Processing” is a step of preparing a sintered

product. On the other hand, in the present invention, the slurry is disposed on the surface of the sintered magnet form which has already been sintered. Further sintering is not conducted after disposing the slurry.

Applicants respectfully disagree with the rejection of claim 12 and would submit that the Examiner has mischaracterized the resulting combination of Kim et al. and Mitsuji.

The Examiner admits that Kim et al. does not teach using an acid, alkali, or organic solvent to clean the magnet form. However, the Examiner asserts that Mitsuji teaches that it is beneficial to add several other layers to the surface of a Nd-Fe-B type magnet due to this composition's inherently poor chemical resistance, which is improved by adding nickel and copper coating to prevent chemical degradation. In order to add this layer the magnet must first have its outer surface later removed, since this layer has been degraded by the manufacturing process. The use of this process would clean the surface of the magnetic form in order to allow the plating process to occur. Thus under this interpretation the particles of Kim et al. are an initial magnetic form, where the formed particles represent a final magnetic form.

Applicants agree that Mitsuji teaches that magnet substrate is coated with a triple layer of nickel plating, and such plating requires an acid etching step prior to adherence of the plating. However, the plating is added on top of the sintered magnet form.

Claim 12, as clarified, recites a step wherein a surface layer of the sintered magnet form is cleaned with at least one of alkalis, acids and organic solvents **before the step of disposing the powder** on the surface of the magnet form, and then effecting the heat treatment. Applicants note that "the powder" refers to the powder of claim 1, which comprises "one or more members

selected from an oxide of R^2 , a fluoride of R^3 , and an oxyfluoride of R^4 wherein R^2 , R^3 and R^4 each are one or more elements selected from among rare earth elements inclusive of Y and Sc”.

Therefore, even if the cited references were combined as asserted, the invention of claim 12 would not be reached because such combination would apply an etching step after the step of disposing the rare earth powder, rather than before it. Therefore, not all of the claimed limitations would be met by the cited combination.

Further with respect to claim 13, Applicants respectfully disagree with the rejection of claim 13 because the Examiner appears to have mischaracterized Hamada et al. Claim 13, as herein clarified, recites a step wherein a surface layer of the sintered magnet form is removed by shot blasting before the step of disposing the powder on the surface of the magnet form, and then effecting the heat treatment. Applicants note that “the powder” refers to the powder of claim 1, which comprises “one or more members selected from an oxide of R^2 , a fluoride of R^3 , and an oxyfluoride of R^4 wherein R^2 , R^3 and R^4 each are one or more elements selected from among rare earth elements inclusive of Y and Sc”

Applicants agree that Hamada et al. teaches that a solution comprising a flake fine powder and a silicone resin is applied over a rare earth magnet and subsequently baked to form an adherent composite coating, thereby providing a corrosion resistant rare earth permanent magnet. However, the powder mixed with the silicone resin is one or more of Al, Mg, Ca, Zn, Si, Mn or an alloy thereof. Therefore, even if the cited references were combined as asserted, the invention of claim 13 would not be reached because not all of the claimed limitations would be met by the cited combination.

Further with respect to claims 12 to 14, Applicants note that the aim of a pre-treatment for plating is different from the aim of a pre-treatment for the heat treatment according to the present invention. Further, the aim of a pre-treatment for the adherent composite coating is also different from the inventive pre-treatment. Therefore, a pretreatment for plating or adherent composite coating would not prompt one to reach the present invention.

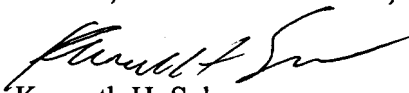
In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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